

BASIC INFORMATION

SG Application/ Registration No.:	9290612-2		
United Kingdom/European Patent No.:	0357151	Date of filing of United Kingdom/European Patent:	31/Aug/1989
Priority claimed:	01/09/1988 NL 8802165		
Title of Invention:	METHOD FOR MANUFACTURING A BUILDING STRUCTURE.		
Applicant/Proprietor:	INTERNATIONAL DOME SYSTEMS VAN SWIETENLAAN 23A NL-3083 DS ROTTERDAM NETHERLANDS. NETHERLANDS		
International Patent Classification:	E04G 11/04, E04B 1/16		
SG Publication No.:	25582		
Gazette Number:	52/92	Gazette Date:	10/23/1992

Description

The invention relates to a method for manufacturing a building structure in accordance with the preamble of claim 1.

A method of this kind is known from USA-4,155,967.

According to said known method the foam layer is applied layer by layer and the foot plates of the anchors are attached by means of adhesive to the first foam layer. This attachment is insufficient. Many anchors fall down under the influence of the forces which occur during spraying and due to deformations of the form by wind forces. Even after surrounding the anchor feet by the next foam layer applied over said feet said anchors are not capable to take up the loads which occur during attachment of the reinforcing rods and during spraying of the concrete.

Purpose of the invention is to provide a method by means of which the progress of the work is not disturbed by anchors which do not maintain their proper position.

According to the invention this purpose is achieved by the characterizing features of claim 1.

By the fact that the foam layer has obtained its final thickness prior to mounting the anchors it is possible to insert the bent over parts of the feet of the anchors easily into the foam layer. Due to this the anchors are quickly attached.

By the fact that moreover the first concrete layer is sprayed over said feet and covers said feet, a hard layer is obtained which holds the anchors in a manner such that they can no longer loosen and are capable to carry the weight of the reinforcing rods and are capable to withstand the forces which occur during spraying of the concrete on the anchors and reinforcing rods, including the weight of not yet completely hardened concrete parts.

Preferably the reinforcing is one which at least in horizontal planes is pretensionable. This is made possible by the rigid attachment of the anchors.

It is observed that from US-A-3,277,212 a method is known for the manufacturing of a building structure by making use of an inflatable form against the inner side of which a foam layer is sprayed until the layer has its full required thickness. After spraying and completing said layer anchors are inserted into the foam layer in the form of wire clips having a barbed or turned over flared end which provide an attachment such that prior to any spraying of concrete reinforcing rods can be attached to said anchors. The mounting of said anchors by pressure or hammering is time consuming and can damage the foam layer. Concrete is only applied for the first time after the reinforcing rods are placed. Although said known method discloses the possibility of primarily manufacturing the foam layer until its final thickness is obtained it has disadvantages in respect of the mounting of the anchors.

Spraying of the resin can be performed such that the entire inside of the form is covered so that a building structure is already obtained from resin such as a resin dome.

It is also possible to spray part of the height with resin and to start spraying the concrete already whilst the spraying of the resin proceeds upwardly towards the top.

Mounting of the reinforcing rods can take place such that the reinforcing is completed first prior to applying the further concrete layers. One, however, can also perform the work in such a way that said concrete layers are applied after mounting part of the reinforcement in which case the mounting of the reinforcing rods proceeds upwardly followed by the application of the concrete, which application of the concrete of course starts at the basis.

The synthetic form can remain in place or be removed respectively. For performing the work use can be made of a movable platform lifting device having at the outer end of a swingable and extendable arm a work platform from which any position inside the blown form can be reached with spraying devices.

With the invention it is possible to manufacture building structures of preferably dome shaped configuration in a simple manner. They can have a circular basis and be part spherical. They however may have as well an oval basis or even a rectangular basis.

The invention concerns as well an anchor for applying the method according to the invention which anchor as known from US-A-4,155,967 has a perforated footplate to which a rod is attached which anchor according to the invention has tongues which are cut free from the plate and bent into a position perpendicular to the plane of the plate and turned away from the rod.

Said anchor has a shape such that it can be inserted with said tongues into the foam layer.

The invention will be further illustrated with reference to the drawings.

Figure 1 shows part of a building structure according to the invention.

Figure 2 shows a possible embodiment of the anchor.

Figures 3a to f inclusive show different phases of the method according to the invention.

The building structure which can be obtained with the invention has a form 1 which by blowing is brought into the proper shape and is made from plastic. Against the inside a foam synthetic layer 2 is applied by spraying. The anchors 3 are fixed upon said layer and reinforcing rods 4 are attached to said anchors. For mounting the anchors use can be made of an auxiliary reinforcement 4' such as rods which support the anchors for and during performing further operations. The space around said reinforcing rods which is defined outwardly by the foam synthetic layer 2 is filled with concrete 5 by spraying. Prior to building

the concrete layer 5 layer by layer a first layer 5' is sprayed over the feet 8 of the anchors. The plastic form 1 is connected in an air-tight manner at 6 to a pre-fabricated foundation 7.

The anchors may have the form shown in figure 2 comprising a perforated footplate 8 having bent over tongues 9, which can be pressed into the foam synthetic layer 2 and with an outwardly extending rod or arm 10 serve for connecting to them the reinforcing rods. By applying the first concrete layer 5' said anchors are well held in place sufficiently to carry the reinforcing rods.

Figure 3 shows in figure 3a diagrammatically a part of an annular foundation 7 which has to be provided.

Figure 3b shows the application of the form 1 in the not yet inflated condition.

Figure 3c shows the inflation by means of fans 11. The inflated hall is provided with an air lock 12 known in itself.

Figure 3d shows the inflated hall in a cut-open way. Present in the hall is a working device 13 having a working platform 14, by means of which through a supply conduit 15 synthetic foam, such as polyurethane can be supplied by the schematically shown device 16 and sprayed upon the inner side of the inflated form 1.

Figure 3e shows the mounting of horizontal annular reinforcing rods as well as reinforcing rods extending in vertical planes, after which, as shown in figure 3f, by means of the device 13 concrete 5' and 5 respectively can be sprayed.

The hall obtained finally no longer needs the fans and entrance lock respectively.

In case windows are needed auxiliary frames can be placed with the aid of anchors upon the synthetic foam layer 3 as schematically indicated at 17 in figure 3d. After completing the building structure, which means after hardening of the concrete, which concrete surrounds the auxiliary frames, the plastic layer of the form and the foam layer can be cut away and a real window frame with or without glass can be placed in the opening obtained therewith.

Claims

1. Method for manufacturing a building structure in which an inflatable form (1) which has been provided with an entrance lock (12) is mounted in an air-tight manner on a base or foundation (7) which form (1) by means of suitable devices is inflated and after having obtained its correct shape by inflation a foam resin layer (2) is sprayed upon the inner side of the form (1), anchors, each having a perforated foot plate (8) to which an anchoring rod (10) is attached, are placed with their plate-shaped feet (8) on said foam resin layer (2), whereby said anchoring rods (10) are

inwardly directed, reinforcing rods (4) are attached to said anchoring rods (10) after spraying a first layer concrete (5') upon the foam layer (2), characterized in that primarily the foam resin layer (2) is manufactured until its final required thickness is obtained, that only thereafter the anchors (8, 10) are placed and fixed to the foam layer (2) by inserting of bent portions (9) which are cut free from the plate (8) and bent over into a position perpendicular to the plane of the plate (8) and turned away from said rod (10) and that the first concrete layer (5) is sprayed over the feet (8) of said anchors which lie against the inner side of the foam layer (2).

2. Method according to claim 1, characterized in that the reinforcement at least in horizontal planes is a pre-tensionable reinforcement.

3. Method according to claim 1 or 2 in which for the manufacturing of window frames and the like frames are placed which are fixed by the spraying of the concrete layer, characterized in that the frames are temporary frames of which form and dimension correspond to the form and dimension of the final window frames, which frames are placed upon the foam layer and after the application of the concrete, form material and foam are removed at the location of the frames and said frames are removed and replaced by the final window frames.

4. Anchor for use in the method according to one or more of the preceding claims comprising a perforated foot plate to which a rod is attached, characterized in that said plate (8) has tongues (9) which are cut free from the plate (8) and bent over into a position perpendicular to the plane of the plate (8), and turned away from said rod (10).

Patentansprüche

1. Vorfahren zum Herstellen eines Gebäudes, bei dem eine aufblasbare Form (1), welche mit einer Ein- fahrtsschleuse (12) versehen ist, luftdicht abschlie- ßend auf einer Basis oder einem Fundament (7) angebracht wird, welche Form (1) mit Hilfe geeigneter Einrichtungen aufgeblasen wird und nach Erhalten der genauen Gestalt durch das Aufblasen eine Schaumharzschicht (2) auf der Innenseite der Form (1) aufgespritzt wird, Anker, die jeweils eine perfo- rierte Fußplatte (8) haben, an welcher ein Ankerstab (10) angebracht ist, mit ihren plattenförmigen Füßen (8) auf die Schaumharzschicht (2) gelegt werden, wobei die Ankerstäbe (10) nach innen weisen, und Bewehrungsstäbe (4) an den Ankerstäben (10) ange- bracht werden, nachdem eine erste Beton- schicht (5') auf die Schaumharzschicht (2) gespritzt wurde, dadurch gekennzeichnet, daß die Schaumharzschicht (2) zuerst hergestellt wird, bis ihre abschließend erfor- derliche Stärke erreicht ist, daß nur anschließend die Anker (8, 10) auf die Schaumharzschicht (2) gelegt und